Docket #85492-102

EXAMINER Saeeda Monee Latham

GROUP 1782

APPLICANT Tim Wiens

SERIAL NO: 10/589.135

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FOR PREPARATION AND USE OF HIGH OMEGA-3 AND OMEGA-6 FEED

U.S. Patent and Trademark Office
2011 South Clark Place
Customer Window, Mail Stop
Crystal Plaza Two, Lobby, Room 1B03
Arlington, Virginia 22202
U.S.A.

Dear Sir

AFFIDAVIT

1. I, Jeffrey Lyle Hart of 9 Rendek Avenue, Regina, SK, S4X 2V2 do hereby attest that:

2. I began working with Oleet Processing (P.O. Box 26011, Regina, SK, S4R 8R7) in January 2001 and continued with the company until October 2007.

3. Oleet Processing was started in the late 1990's as a partnership between O&T Farms and 3 other major shareholders. In 2002 O&T Farms bought out the remaining shareholders to become the sole owner of Oleet Processing.

4. As can be seen from my attached resume, I worked as a production hand with Oleet from Jan 2001 – December 2002. I transferred to the feed mill as manager in Jan 2003 remained in that role until Mar 2006. I became production supervisor in March 2006 and held that position until end of employment with Oleet in Oct 2007.

5. We wanted to develop this product as an animal feed additive because as feed producers ourselves we saw a need in the feed industry for an easy to use oilseed and pulse based product that had no animal biproducts. Commercial livestock depend on energy dense feeds and the inclusion of oilseeds in the feeds makes increasing the energy content much easier. Pulses are an excellent source of proteins and including them in livestock diets is a very cost effective method of delivering the protein to the animal. We wanted to create a product that was easier to handle than the liquid alternatives available at that time within the industry. Also, the oilseed and pulse blend allows the diets to be formulated without the addition of any animal bi-products which are the most readily available commercial alternatives. We named our product LinPro and kept the name with the product for all variations during our development process.

6. When we initially began working with on this project, we used a coarse grind (1100-1300 microns) for several reasons, discussed below. Specifically, it is noted that such a coarse grind was used in the experiments and trials carried out by Thacker and described in the reference cited by the examiner.

7. Our company has been in the poultry business since 1967 and has extensive experience feeding the birds a mash style diet prepared in our own feed mill. Our experience with the birds taught us that the birds will selectively eat a granular product before a powder, which is common knowledge throughout the industry.

8. From a mechanical perspective, a coarse grind made more sense as well. In terms of capacity, most grinding equipment can be adapted to perform a variety of grind sizes, but all grinders will lose capacity as the particle size of the final product is reduced. This loss of capacity is because grinders work by smashing the product until the pieces are small enough to fall through a screen. When grinding to a finer particle size, the hammers must hit the product more times before the product is small enough to pass through the smaller screen. Also, the more the size of a grain is reduced, the greater the cost in terms of wear on grinder parts. Under normal conditions the abrasion of the grain

will wear down the parts inside the grinder over several weeks and those parts will need to be replaced. It has been my experience that reducing the screen by one size will shorten the life of the wear parts inside the grinder by about 10%. These wear parts are expensive and replacing them is a time consuming job. In addition, the more the particle size of a seed is reduced, the greater the 'shrink' on the seed itself. 'Shrink' is a term used in the grain industry to refer to the loss of product mass as it moves through a process. Some of this 'shrink' comes in the form of airborne dust or losses from trying to contain fine powder in a closed system. The remainder of the 'shrink' comes from moisture loss as a greater surface area allows more moisture to leave the seed.

9. It is also important to note that physically handling a fine particle is considerably more difficult than handling a whole seed or a large particle. Fine particles have a tendency to bridge within storage spaces, require steep slopes to flow downwards (in bins or spouts) and due to their increased surface area are at a high risk to reabsorb environmental moisture and stick to the mechanical system.

10. Finally, in terms of mixing, it is common knowledge throughout the feed industry that particles of like size will mix the most efficiently. The general opinion in the feed industry is that the greater the difference between the size of particles, the greater the difficulty in achieving a homogeneous mix and the greater the risk of ingredient separation after mixing. Ingredient separation would cause both very oily low protein patches and very low energy, excessively high protein portions of the product. With laying hens eating only 100g of feed per day, only 10-20% of which is our product, this separation would lead to drastic changes in diet on a daily basis depending on what part of the mixture they were eating. Drastic diet changes like this would significantly decrease the production of any commercial livestock. This led us to target a particle size that was close to the size of the oilseeds in the mixture. Thus from almost all initial perspectives, it seemed to make the most sense to target a particle size that was close to the size of the oilseed.

11. Regarding the extrusion process, the coarse grind also seemed to be the logical choice. Our understanding of extrusion was that the heat and pressure would be generated by the machine as it forced the mixture through a series of mechanical restrictions within the extruder. Initially, we believed that the actual mechanism of heat generation was *solely* the friction of the mix with the extruder parts. Also, we believed that a coarse pulse would aid in the mechanical breakdown of the oilseed more than a fine particle would.

12. Whole raw oilseeds are highly indigestible. To feed oilseeds to commercial livestock in a manner that is nutritionally effective, the oilseed must be mechanically broken down and usually heat treated. The extrusion provided the mechanism by which the oilseeds were simultaneously broken down and heat treated. Our initial work with the extrusion intended to take the oilseeds, which are difficult to work with in a feed production setting, and create a user friendly product that was nutritionally *equivalent* to the sum of its ingredients (in terms of digestibility). Our early work with extrusion achieved this goal. Testing through feeding trials showed us that our product was safe for use and could be incorporated into diets at a variety of levels.

13. Examination of the results of feeding trials showed us that our product was having a greater effect within the diet than we had originally expected. While we had initially targeted a product that was essentially a mechanical advantage for feed manufacturers, we were seeing a product that in some cases was nutritionally slightly greater than the sum of its parts (in terms of digestibility). The Thacker trial (2003) showed us that including our product in the diet of broilers slightly improved feed conversion in broiler chicks from 1.5 to 1.57 (table 5) despite the fact that the LinPro diet had lower protein and energy in the feed than the control diet which contained no LinPro (table 4). Logically, the lowered protein and energy should have resulted in lower feed conversion. This prompted us to more closely examine our process to see if we could enhance this slight effect.

14. We thought this slight increase could be from a variety of factors in our process. We thought that the temperature could be "cooking" the product to

make it more digestible. However we knew that the proteins in the product are at risk of being denatured at elevated temperatures, so it would be a delicate balance between maximum cooking of the product and not denaturing the proteins. Also, we knew that the pressure was important in driving the oil into the pulses so that the oils would be protected during early digestion. We also believed initially that the large particle size was critical for protecting the oil from degradation in the upper digestive tract so that it was still available for use in the lower digestive tract.

14. As the examiner will appreciate, there are a lot of variables in the process and due to the nutritional aspects it was quite time consuming to effect changes to the product. The nutritional parameters cannot be visually assessed and visually similar products may be very different in their nutritional composition. Thus after any change to the product we would have to wait either several days for a lab analysis or up to several weeks or even months for feeding trials. Also, because there are so many variables, changes could only be done one at a time. If multiple changes were made to the product simultaneously, there would be no way to determine which production change was producing which nutritional change. Changes were made one at a time with time for analysis in between. While conventional manufacturing might be able to run several versions of a new product close together, with this being a nutritional supplement we had to wait between trial batches to see the biological effect on livestock or wait for lab analysis to be performed. Because of the scale, commercial livestock feeding programs are very sensitive to small changes. A small effect multiplied over a large herd or flock can have significant consequences. Therefore testing was a very time consuming process, lasting several years.

15. Since our initial target was to produce a nutritional equivalent to pulses and oilseeds in a mechanically advantageous form, we had to work within very small profit margins. We were competing with the raw pulses and oilseeds and could up charge only for the convenience or mechanical ease of use. Because of this, our initial focus on improving the product was essentially at a cost equivalent level. At this point, the changes we were making to the process

were done without increasing the cost of the process. Unless we could show that our product was better, we had to maintain our pricing near that of the raw pulses and oilseeds as we couldn't justify a more expensive process. We worked with variations of temperature and pressure and modifications of the blend ratios. It was not apparent at the time that we could justify the increased cost of additional processing (grinding) of the raw pulses. Through modifications to temperature and pressure, we were able to enhance the nutritional value of the product enough to see that that there was a small but consistent improvement. It was at this point that we began to look for efficiencies within our process. We began to look for efficiencies in the process because we felt that while we were seeing improvement in the product we still couldn't justify the added expense of a larger process change. We tried to improve process efficiency in an effort to improve margin on the product as the profit margin was still very small.

16. One of our early changes to particle size was to increase the particle size to approximately 1500 microns in an attempt to increase capacity and reduce cost. While this did increase the capacity, we found that surprisingly we actually decreased the value of our product. With a larger particle size the product was sticky and lost the mechanical advantage of being easy to handle. Oil absorption was very low due in large part to the reduced surface area. Also, we saw selective feeding in our own laying hen flocks as the birds would pick around the larger particles. Up to this point we felt that the majority of product change was taking place inside the extruder itself. We had believed that the purpose of grinding was to reduce particle size for mixing efficiency and did not understand how big an impact it had on the extrusion process. The large particle size led to poor gelatinization and led to difficulties maintaining optimum temperatures. It was at this point (October 2003) that we began to focus on particle size as an important factor in the development of the product.

17. When we saw the dramatic negative effect the increased particle size had on the product, we underwent a shift in our approach to particle size. We began working with smaller particle sizes in our extrusion process. Surprisingly, we found that even though the particle size of the pulses was far

smaller than the preferred industry sizing for feeding. In the industry, poultry feeds are typically 1000 – 1200 microns and swine is slightly smaller at 650 - 800 microns. Our first attempts with smaller particle sizes were with particles approximately 500 microns. Gradually the particle size decreased from this initial level. We were able to increase gelatinization within extrusion to the point that our finished product could have a particle size *greater* than the particle size of the ingredients. We found that even though conventional thinking would be that a small particle size in the mix prior to extrusion would create an excess of fracture points in the finished product, the gelatinization was significant enough to bind the particles together. Thus, rather than having a product which would break apart more easily and thus be less desirable to the birds, we found that the finished product in fact had a larger size and was more stable than expected. Furthermore, while we expected a product where the oil leached out after extrusion due to a small particle size, we found that we actually created larger particles through the increased gelatinization. This new product made with smaller particles was far easier to handle mechanically than the previous product. Nutritionally, we did not degrade the proteins through extrusion as the small particle size gave us excellent control of the temperature in the extrusion process. In addition, we were able to increase the digestion in livestock and reduce selective feeding with the new product.

18. In terms of temperature control, we learned that not only is friction between the mix and the extruder a source of heat generation, but friction between mix particles is a significant source of heat. The finer pulse powder had increased surface area which in turn led to an increase in friction which generated more heat. The heat we had assumed was being produced by forcing a larger particle through a small space was in fact largely being generated by friction between particles.

19. To reduce particle size we were required to make several changes to our grinding equipment. As expected we did see the increase in cost associated with additional parts and maintenance time, but with the dramatic improvement in our product we were now able to justify the additional expense.

20. As discussed in detail above, a finely ground pulse powder was not expected to provide an improved or more desirable product. Quite the contrary, as discussed above, we anticipated that a more coarsely ground pulse product would produce a better end product. Specifically, we anticipated that a powder-based product would be less desirable to the chickens. We also anticipated that a finer pulse powder would result in loss of capacity as a result of longer grinding times, more frequent maintenance of the grinding equipment and significant loss of product due to shrinkage. This shrinkage and additional maintenance would add considerable cost to a product with small profit margins. As a key aspect of the process was the use of whole or intact oilseeds, we anticipated that mixing particles of different sizes (whole oilseeds and a fine pulse powder) would produce a final product that would separate out or otherwise be non-homogenous. A product with this type of separation would be both difficult for feed manufacturers to handle and would drastically reduce production in commercial livestock operations. Finally, we expected that the extrusion process would be more effective if a coarser ground pulse was used. However, we surprisingly found even coarser ground pulse product reduced the small benefits we were seeing while the more finely ground pulse powder produced an end product which had surprising properties which more than compensated for the additional cost and loss of product associated with the more finely ground product.

21. In summary, as discussed above, there were many reasons to not use a more finely ground pulse powder, especially in view of the narrow profit margin associated with the product and the expected additional costs and losses associated with the more finely ground pulse powder.

22. I declare that all statements made herein of MY own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code and that such

willful false statements may jeopardize the validity of the instant patent application or any patent issuing therefrom.

Sincerely

Jeff Hart 17 Dec. 2010

Jeffrey Lyle Hart

JEFF HART

9 Rendek Avenue, Regina, SK

EXPERIENCE

October 2007–Current — CanMar Grain Products, Regina, SK
Director of Operations
- Responsible for supervising all production in a small food production facility.

March 2006-October 2007 — Oleet Processing, Regina, SK
Production Manager
- Responsible for the operation of two feed extrusion facilities

January 2003 –March 2006 — Oleet Processing, Regina, SK
Feedmill Manager
- Produced feed for 125,000 laying hens and 50,000 pullets
- Operated an extrusion line to manufacture feed suppliments

Jan 2001 – Jan 2003 — Oleet Processing, Regina, SK
Production Hand
- Responsible for operating process equipment
- Ran extruders, mixers and grinders asscociated with feed extrusion

September 1999–November 2001 — 06 Ranch, McLean, SK
Barn Manager
- Ran the barn for a large PMU operation
- Responsible for feeding and calving 150 cows

May 1994–Sept 1998 (Summers) — Fox Hollow Farm, Elm Creek, MB
Farm Manager
- Handled the livestock husbandry for a small mixed farm
- Responsible for breeding program for 150 horses and 80 cows
- Responsible for care of small broiler and turkey flocks.

EDUCATION

1995-1998 Brandon University — Brandon, MB
- Studied Sciences of Zoology and Chemistry

1995 Carman Collegiate — Carman, MB
- High School Diploma